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ANTONELLA FUSILLO

(Name of person mailing paper or fee)

SEP 05 2000

(Signature)

**TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED
OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371**

 Attorney's Docket No:
PRZYTULLA-12

INTERNATIONAL APPLICATION NO.

PCT/EP99/01398

INTERNATIONAL FILING DATE

March 4, 1999

PRIORITY DATE CLAIMED

March 5, 1998

TITLE OF INVENTION

EXTRUSION HEAD

APPLICANT(S) FOR DO/EO/US

DIETMAR PRZYTULLA & PETER LANGOS

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ Original or facsimile of an oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

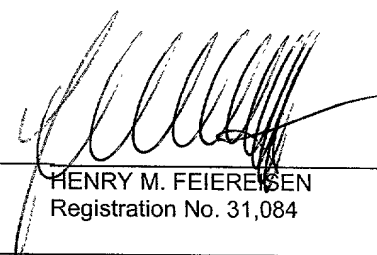
U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/1623773		INTERNATIONAL APPLICATION NO. PCT/EP99/01398	ATTORNEY'S DOCKET NO. PRZYTULLA-12
17. <input checked="" type="checkbox"/> The following fees are submitted : BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):			
<input checked="" type="checkbox"/> For filing with EPO or JPO search report (37 C.F.R. 1.492(a)(5))		\$ 840.00	\$840.00
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(1))		\$ 670.00	
<input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(2)) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2))		\$ 760.00	
<input type="checkbox"/> Neither international preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(3)) nor international search fee paid to USPTO (37 C.F.R. 1.445(a)(2))		\$ 970.00	
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(4)) and all claims satisfied provisions of PCT Articles 33(2)-33(4)		\$ 96.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			
Claims	Number Field	Rate	
Total Claims	12-20	x \$ 18.00	
Independent Claims	1-3	x \$ 78.00	
Multiple dependent claims (if applicable)		x \$260.00	
TOTAL OF ABOVE CALCULATIONS			\$840.00
Reduction by 1/2 for filing by small entity, if applicable. Verified small entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)			
SUBTOTAL			\$840.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date 37 CFR 1.492(f).			
TOTAL NATIONAL FEE			\$840.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +			\$ 40.00
TOTAL FEES ENCLOSED			\$880.00
Amount to be refunded			
charged			

- a. ☒ A check in the amount of **\$880.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. **06-0502** in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **06-0502**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:

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 Date: September 5, 2000


 HENRY M. FEIEREISEN
 Registration No. 31,084


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No.: PRZYTULLA-12

In re Application of:)
DIETMAR PRZYTULLA & PETER LANGOS)
Int. Appl. No.: PCT/EP99/01398)
Int. Filing Date: March 4, 1999)
For: EXTRUSION HEAD)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Express Mail mailing label number: EL492057225US
Date of Deposit: September 5, 2000
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231
ANTONELLA FUSILLO
(Name of person mailing paper or fee)

(Signature)

S I R:

Preliminary to the first Official Action in the above-entitled application,
please amend the application as follows:

IN THE SPECIFICATION:

Page 1, line 2, add the heading --BACKGROUND OF THE INVENTION--.

Page 3, line 3, add the heading --SUMMARY OF THE INVENTION--.

Page 5, line 20, add the heading --BRIEF DESCRIPTION OF THE DRAWING--.

Page 7, line 11, add the heading --DETAILED DESCRIPTION OF PREFERRED
EMBODIMENTS--.

Page 19, delete completely.

Page 20, after the heading "CLAIMS" and before the first claim add --What is
claimed is:--.

IN THE CLAIMS:

Amend the following claims:

Claim 3, line 1, delete "or 2".

Claim 4, line 1, delete "2 or 3,".

Claim 6, line 1, change " one of the preceding claims 1 to 5" to --claim 1--.

Claim 7, line 1, change " one of the preceding claims 1 through 6" to --claim 1--.

Claim 9, line 1, change " one of the preceding claims 1 to 8" to --claim 1--.

Claim 11, line 1, change " one of the preceding claims 1 to 10" to --claim 1--.

REMARKS

This Amendment is submitted preliminary to the issuance of an Office Action in the present application.

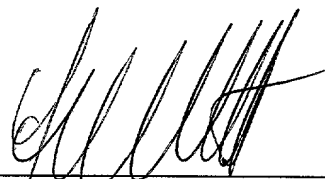
Applicant has amended original claims 3, 4, 6, 7, 9, 11 to remove any multiple dependency. In addition, applicant has amended the specification to present it with proper headings.

When the Examiner takes this application up for action, it is requested to take the foregoing into account.

The Commissioner is hereby authorized to charge fees which may be required, or credit any overpayment to Deposit Account No. 06-0502.

Respectfully submitted,

By:


Henry M. Feiereisen
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Reg. No. 31,084

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EXTRUSION HEAD

The invention relates to an extrusion head for producing a tubular parison for the manufacture of blow-molded plastic hollow bodies, including an adjustable ring-shaped tube outlet nozzle with annular nozzle/mandrel gap adjustment elements which permit a targeted adjustment of the nozzle gap for varying the wall thickness of the exiting parison.

Typical examples of such blow-molded parts of thermoplastics, in which customarily a targeted wall thickness adjustment is carried out in longitudinal direction of the tube and in circumferential direction of the tube, include large-volume containers such as, for example, canisters, lidded drums, bung drums or inner receptacles for pallet containers. During ejection of the tubular parison used for such blow-molded parts, the wall thickness of the tube is so adjusted by a rotation-symmetrical nozzle/mandrel gap control mechanism in longitudinal direction of the tube that the wall is slightly thinner toward the lower end and slightly thicker toward the upper end in direction of the discharge valve, because the tube as a consequence of its own weight lengthens by itself when suspended to thereby automatically realize an even axial wall thickness. Superimposed thereto is a partial wall thickness control in circumferential direction which is realized by a double nozzle/mandrel gap control mechanism in the tube in those tube zones which are provided in the blow-molded hollow body for the head and

bottom areas at greatly varying degrees of elongation - particularly in the areas which are offset by 90° to the partition plane of the blow mold halves.

With double nozzle/mandrel gap control mechanisms (= two control choices) known heretofore, the wall thickness of such blow molded parts can be controlled over their length with respect to:

- uniform radial wall thickness
- radial and circumferential wall thickness
- radial wall thickness with axially extending thick and thin areas, and
- partial longitudinal thick/thin areas.

Various constructions of extrusion heads are known for such tube adjustments by means of nozzle/mandrel gap control, for example from German Pat. No. 26 54 001, U.S. Pat. No. 3,114,932 or U.S. Pat. No. 1,107,628. Although for standard applications, simple conventional or the double nozzle control mechanisms suffice, they lack the capacity to carry out additional influences of the wall thickness. A simple extrusion head is further disclosed in British patent specification 1,107,628 for producing teeth or ribs in the extruded tube for bottles blow-molded from thermoplastic material. By means of V-shaped grooves and teeth formed in the ejector die, the blown bottles should receive in particular a decorative look. The central mandrel can be adjusted axially so that the ejected tube may or may not be acted upon by the teeth. A further adjusting option or

possible influence to permit a targeted wall thickness adjustment is, however, not possible.

It is an object of the present invention to obviate the mentioned drawbacks of the prior art and to improve the extrusion head of the type as described above with a double nozzle/mandrel gap control so as to permit a further additional superimposed wall thickness adjustment of the ejected tube for large-volume plastic containers such as 220 liters drums and - particularly also for asymmetric technical parts such as e.g. plastic fuel tanks (KKB) or for special applications in large cylindrical blow molded parts.

This object is attained in accordance with the invention by providing at least three separate nozzle/mandrel gap adjustment elements (D 0 = mandrel, DS I, DS II, DS III) which are separately controlled, differently profiled, and adjustable, and which individually or/and simultaneously can be brought into active engagement in the nozzle gap with the exiting parison from inside and outside.

Since the tube outlet nozzle is equipped with a triple nozzle/mandrel gap control mechanism, special thick areas can be so adjusted at particular locations of the tube depending on the blow molded hollow body in dependence on the configuration of the third nozzle/mandrel gap adjustment element, or further adjustment elements and on the duration of the intervention or impact on the

1 extruded parison, that the final blow molded hollow body exhibits only in the
2 desired wall regions different or thicker wall thickness in comparison to the
3 minimum wall strength of the typical wall.

4
5 A canister can, for example, be provided with stiffening ribs only at the
6 vertical corner areas. In a KKB, the walls can also be made specifically thicker
7 and thus more stable, e.g. in the side areas of the top bottom or at those areas at
8 which connection stubs of fuel pipes are blow-molded thereon, or measuring
9 instruments for a fuel tank level gauge are to be installed. In bung drums or
10 lidded drums, it is possible to adjust a ribbed wall construction with uniform thick-
11 thin distribution only in the vertical wall areas through a targeted material
12 redistribution while, for example, maintaining the existing drum weight, thereby
13 measurably improving the stiffness of the container, and in particular, the
14 stacking strength when charged with hot contents. This is especially of particular
15 importance in connection with large-volume drums (220 liters). Remarkably, the
16 steps for quality improvement of the blow-molded hollow plastic body are realized
17 exclusively on the exiting parison itself and not through constructive redesign of
18 the blow mold.

19
20 As shown by way of example only, the novel triple or multi-nozzle/mandrel
21 gap adjustment elements according to the novel invention results
22 advantageously in a variety of new possibilities of application for large-volume
23 blow-molded plastic parts of all types (e.g. automobile accessories or the like).

1 Compared to a conventional extrusion head with heretofore dual
2 nozzle/mandrel gap adjustment elements, the provision of an extrusion head with
3 the novel triple nozzle/mandrel gap adjustment elements according to the
4 invention can be realized comparably inexpensively and does not require any
5 investment in machines. The adjustment elements are moved only over very
6 short distances, and only simple control motors are sufficient, and no deformation
7 of the adjustment elements is experienced.

8
9 The process according to the invention for producing blow-molded hollow
10 plastic bodies by a blow mold machine with extruder, extrusion head with
11 circumferential distributor and respective blow mold, and carrying out a particular
12 adjustment of the wall thickness of the exiting parison during ejection of the
13 tubular parison from the extrusion head through adjustment of the
14 nozzle/mandrel gap, is characterized in particular by realizing a random,
15 circumferentially varying thick-thin adjustment of the tubular parison through a
16 sequential or simultaneous impact of three differently profiled, separately
17 adjustable nozzle/mandrel gap adjustment elements. This multiple adjusting
18 capability of the tube for large-volume drums is unique and results in a quality of
19 the drums that has been unattainable to date.

20
21 The invention will now be explained and described in more detail by way
22 of exemplified embodiments illustrated only schematically in the drawings, in
23 which:

1 FIG. 17 shows a fassett (canister of upright size) as
2 blow-molded hollow body;

3

4 FIG. 18 shows a canister (jerrican) as blow-molded hollow
5 body;

6

7 FIG. 19 shows a tubular parison with cross sections; and

8

9 FIG. 20 shows a cross sectional illustration of a schematically
10 illustrated plastic fuel tank (KKB).

11

12 FIG. 1 shows an extrusion head 10 with fragmentary illustration of three
13 adjustable nozzle/mandrel gap adjustment elements D 0, DS I and DS II in the
14 basic position "nozzle gap closed". Arranged centrally in the extrusion head 10 is
15 an axially adjustable mandrel holder 12 with an underside which has secured
16 thereon an easily detachable and exchangeable truncated cone shaped mandrel
17 14 as first nozzle/mandrel gap adjustment element Dzero (= D 0). To the outside,
18 the extrusion head is enclosed by a housing 16. Accommodated in the housing
19 16 is a hollow cylindrical storage space 18 in which the molten plastic material
20 fed from one or several extruders has been circumferentially distributed. The
21 storage space 18 ends in a circular ring-shaped nozzle gap 20 which is
22 demarcated on the inside by the mandrel 14, and the first nozzle/mandrel gap
23 adjustment element D 0 and on the outside by a stationary nozzle ring part DF

1 and two adjustable nozzle/mandrel gap adjustment elements, namely the nozzle
2 slide 1 = DS I and the nozzle slide 2= DS II. Like the adjustable mandrel 14, also
3 the axially adjustable adjustment elements DS I and DS II are secured to the
4 extrusion housing for easy detachment and exchange. The axial adjustment and
5 exact positioning of the adjustable nozzle/mandrel gap adjustment elements may
6 be realized e.g. hydraulically or electromotorically. Furthermore, the housing-
7 fixed nozzle ring part DF is likewise secured to the extrusion head in a manner
8 that permits easy detachment and exchange.

9
10 This is of particular importance in order to realize during a product change
11 or replacement of the subsequent blow mold also a rapid exchange of the ring
12 parts and adjustment elements of the nozzle gap, which are suited to the product
13 at hand and accordingly profiled.

14
15 In the extrusion head 10 shown in FIG. 1, all nozzle/mandrel gap
16 adjustment elements are returned to their basic position "nozzle gap closed", i.e.
17 the mandrel D 0 has traveled to the uppermost position, and the nozzle slide =
18 adjustment elements DS I and DS II have traveled to the lowermost position. The
19 respective lengths of path = adjustability of the adjustment elements, are
20 indicated by the respective arrows. In the illustrated exemplified embodiment, the
21 nozzle gap defining surfaces of the fixed nozzle ring part DF and the adjustment
22 element DS I are profiled, and the nozzle gap defining surfaces of the

mandrel D 0 and of adjustment element DS II have smooth circumference, as further described with reference to the following Figures.

In FIG. 2, only the mandrel 14 is slightly moved downwards (see arrow). The nozzle gap 20 is demarcated at the outside by the lower inner circumferentially smooth edge 24 of the nozzle slide DS II, and at the inside by the mandrel 14. The discharged tube 22 is evenly thin about its circumference. In the partial section of the tube 22, as illustrated therebelow, a small arrow indicates the potential thickness of the tube when the mandrel travels to the lowermost position and the nozzle gap is fully open.

In FIG. 3, the adjustment element DS I together with the adjustment element DS II is slightly moved upwards (see arrow), so that these two adjustment elements are not in operative engagement at that point with the exiting tubular parison 22. The nozzle gap 20 is now demarcated by the mandrel 14 and the profiled housing-fixed ring part DF. The tube exiting the nozzle gap is no longer uniformly thick in circumferential direction, but is slightly thinner in two opposing regions than the respective tube regions respectively arranged offset by 90° thereto. Such a double-oval adjustment of the nozzle gap or oval wall thickness adjustment in areas of the tube is typical for blow molded parts with flat top plate and bottom plate, whereby, the two opposing tube sections 26 with greater wall thickness are so guided between the open blow mold halves that the horizontal container wall areas, which are offset by 90° to

1 the mold partition plane, are blow-molded therefrom with the greatest stretching
2 degrees and blow paths of the plastic material. This feature thus serves as a
3 measure to attain a uniform wall thickness in the finished container, so that the
4 container wall is not thinner in the corner areas with high degrees of stretching or
5 orientation in comparison to the remaining vertical wall parts. FIG. 3 illustrates a
6 sectional view through the thinner tube area (and extrusion head) which bears in
7 the blow mold in the mold partition plane upon the blow mold wall.

8
9 FIG. 4 shows the same position of the nozzle/mandrel gap adjustment
10 elements compared to FIG. 3, but at a 90° rotated section through the extrusion
11 head and thus through a thicker wall zone 26 of the tube 22, as clearly illustrated
12 by the partial sectional view through tube 22 therebelow. To the left, next to the
13 profiled ring part DF, there is indicated a developed view of the known wavy
14 profile of the inner nozzle surface of the ring part DF.

15
16 In FIG. 5 and FIG. 6, the profiled nozzle slide DS I is moved downwards
17 and acts on the exiting plastic tube, while the nozzle slide DS II still remains in its
18 previous upper position outside a zone of influence. The profile of DS I includes a
19 circumferential tooth profile, as clearly shown therebelow by the partial sectional
20 illustrations of the exiting tube 22. The teeth 30 of the profile form a thinner tube
21 wall thickness, and a greater tube wall thickness with outwardly projecting ribs is
22 formed in the tooth gaps 32. FIG. 5 shows the section through the extrusion head
23 and the tube 22 in the area of a thinner tube wall (tooth action 30), and FIG. 6

shows a slightly offset section in the area of a thicker tube wall (tooth gap action 32), with pronounced formation of longitudinal ribs 28. The profile in the fixed nozzle ring part DF, as well as in the nozzle slide DS may be expanded slantingly outwardly or simply parallel to the surface of the mandrel 14. FIG. 6 indicates by way of the small arrow below the nozzle guide DS II, the depth by which the teeth 30 of the tooth profile of the nozzle slide DS I are able to act on the tube 22 from outside. To the left of the nozzle slide DS I is a schematic illustration, in developed view, of the tooth profile of the DS I with teeth 30 and tooth gaps 32. In this embodiment, the lowermost non-profiled nozzle slide DS II, serves actually only as a smoothening element or to cover the profiles of the ring part DF or/and to cover the nozzle slide DS I.

FIG. 7, FIG. 8 and FIG. 9 illustrate a modified embodiment of an extrusion head according to the invention, with the special profile (= tooth profile) formed on the nozzle slide DS II instead of on the nozzle slide DS I, while the nozzle slide DS I has a smooth circumferential surface in direction of the nozzle gap. In FIG. 7, both nozzle slides DS I and DS II are moved into their uppermost position (outside of zone of influence), and only the oval-profile of the housing-fixed ring part DF and the adjustable mandrel 14 act on the tube 22 in the nozzle gap 20. The small partial sectional views on the side indicate on the left a thinner tube wall thickness (in mold partition plane FT) and on the right a thicker tube wall thickness (90° with respect to the mold partition plane FT). In FIG. 8, both nozzle slides DS I and DS II are moved downwards. The DS I has a lower smooth

circumference and covers the oval-profile of the fixed ring part DF, thereby rendering it ineffective. The tooth profile of the lower nozzle slide DS II acts in the nozzle gap 20 on the exiting tube 22 and produces the profiled tube formation with the longitudinal ribs 28, as illustrated in the small partial sectional illustration.

FIG. 9 shows a positioning of the adjustment elements in which no profile is effective, but rather only a circumferentially even change of the wall thickness can be carried out by an axial displacement of the mandrel 14. In accordance with the wall thickness diagrams a, b, and c, which illustrate for each adjustment element a separate control program, as shown in the lower left hand side of FIG. 9, the control of adjustment elements D 0, DS I and DS II for adjusting a desired wall thickness over the length L of the exiting tube is effected at the blow form machine. Diagram a shows - as does the partial sectional view to the right of the ejected tube 22- an even increase of the wall thickness from bottom to top, by opening the nozzle gap 20 through axial displacement of mandrel 14 in downward direction. The added wall thickness for the top plate and bottom plate of the drum, as shown in diagram b, is realized by the oval profile in the fixed nozzle ring part DF which is cleared when the non-profiled and smooth nozzle slide DS I travels upward. At that point, the tooth profile nozzle slide DS I is hereby not effective. For adjustment of the tooth profile in the tube - e.g. for longitudinal ribs in the vertical wall region of the bung drum as shown to the right thereof - the nozzle slide DS II is moved downwards for active engagement, whereby also the nozzle slide DS I moves downwards, thereby covering again

1 the profile of the fixed ring part DF. In order to maintain an even thickness of the
2 tube, the mandrel 14 is also moved simultaneously slightly downwards, and the
3 nozzle gap opened as needed. For clarification, it should be noted that the nozzle
4 slide with the novel tooth profile of the nozzle slide realizes in general only a
5 redistribution of the plastic material in the nozzle gap, whereby the free cross
6 sectional area of the nozzle gap may remain constant.

7
8 Another embodiment of an extrusion head according to the invention is
9 shown in FIG. 10, whereby no profiled housing-fixed ring part is provided and the
10 nozzle slide DS I is also not profiled but exhibits a circumferentially smooth inner
11 surface towards the nozzle gap 20. The known oval profile is formed in the
12 nozzle slide DS II, with an exchangeable mandrel 34 having a special
13 configuration. At its outer circumference, the mandrel 34 is provided in direction
14 of the nozzle gap 20 with a plurality of ribs 14*, which are evenly spaced from
15 one another in a star-shaped manner, and interposed grooves. Disposed at the
16 lower end of the mandrel head 34 is the axially adjustable adjustment element
17 D 0* which is provided exteriorly with correspondingly formed ribs extending
18 upwardly and uniformly spaced from each other for precisely filling in flush
19 engagement the grooves and intermediate spaces between the ribs 14*. When
20 the star-shaped slide = adjustment element D 0* occupies its uppermost basic
21 position, the ribs of star-shaped slide D 0* extend in the nozzle gap 20 flush with
22 the ribs 14* of the mandrel 34, so that the interlocking ribs of the mandrel head
23 34 form a smooth conical surface in the nozzle gap. In contrast thereto, when the

1 star-shaped slide D 0* travels downwards, the intermediate spaces between the
2 ribs and the grooves of the mandrel head 34 are cleared and the stationary ribs
3 14* act in the nozzle gap on the exiting tube 22, thereby forming a tooth profile in
4 the inner surface of the tube in dependence on the geometry of the ribs 14*. An
5 up and down movement of the smooth non-profiled nozzle slide DS I allows, in
6 general, an even adjustment of the wall thickness, while the oval profile of the
7 tube is effected by the respectively profiled nozzle slide DS II, whereby the
8 nozzle slide DS II travels into a lower position, with the minimum wall thickness of
9 the tube being adjusted by the nozzle slide DS I. Then, DS II remains in position,
10 and DS I travels slightly upwards, whereby the oval profile in DS II is cleared, and
11 the tube is formed with respectively thicker walls in the two diametrically
12 opposing zones. This construction of the extrusion head permits a best possible
13 superimposed action of the various adjustment elements upon the tube.

14
15 A further embodiment is shown in FIG. 11, illustrating a modification of the
16 extrusion head shown in FIG. 6, with a ring sleeve as nozzle slide DS III being
17 secured inside the nozzle head DS II for adjustment in circumferential direction.
18 This ring sleeve = DS III has at its bottom side a same tooth profile as the nozzle
19 slide DS I disposed on the inside. Additionally, the nozzle slide DS II is slightly
20 slanted inwardly at the bottom. When downwardly moving the nozzle slide II
21 together with ring sleeve DS III so as to be flush with the nozzle slide I, a rotation
22 of the ring sleeve enables a covering or opening of the teeth of the nozzle
23 slide DS I from the side. In this way, the formation of the rib width on the exiting

could be realized, for example, by an electric spindle motor or a respective small drive. This configuration is suited e.g. particularly for retrofitting existing extrusion heads.

The adjustment elements of all embodiments are basically attached to the extrusion head in an easily exchangeable manner. The nozzle slide with the tooth profile may certainly also be modified depending on the desired profile requirement of the hollow body to be blow-molded (cf. FIGS. 19, 20).

FIG. 16 illustrates a 220 liter lidded drum 36 having longitudinal ribs which are formed in the vertical wall zones and evenly spaced from one another but which do not extend into the bottom region, as shown in the sketched partial sectional illustration below with constant drum wall thickness.

Exemplified embodiment: A 220 l plastic drum (e.g. Vanguard lidded drum) with a drum body weight of approximately 7.5 kg has a largest diameter in the drum wall or foot ring of about 575 mm. The swelling parison exiting the nozzle gap has a diameter of about 270 mm with a wall thickness of about 12 to 25 mm. By means of the adjustment elements, the wall thickness of the tube can be adjusted partially or along sections in this thickness range or adjusted at even greater range. Hereby, the particular adjustment element D 0* is advantageously provided with a rectangular tooth profile, whereby the diameter of the adjustment element D 0* amounts to about 190 mm, and the inner and outer ring edges,

interacting with the ejected tube, have alternately about 60 grooves which are half-round as viewed in cross section, and a complementary number of rectangular teeth, with the width of the grooves being about 4 mm and the width of the teeth about 5 mm. The radial depth of the grooves is thereby about 10 mm. The configuration of the rectangular teeth is hereby of importance; a toothed engagement with pointed saw teeth is unsuitable for large-volume containers according to the invention with a diameter of about 585 mm and a weight of about 8 to 10 kg plastic material, because the extension of the thinner areas in circumferential direction of the drum body must be wider in any case than the thicker areas (= internal ribs) in the axial drum wall of the finished blow-molded hollow body.

FIG. 17 shows a fassett 38 in which only the vertical wall zones are reinforced by longitudinal ribs. This longitudinal ribbing is clearly illustrated in the partial sectional illustration through the container wall.

FIG. 18 shows a canister 40 formed only in the corner regions with two longitudinal ribs which extend, however, to the top plate and bottom plate, as indicated in the partial sectional view below. A longitudinal and cross-sectional view of a tubular parison 22 with special profile for a plastic fuel tank KKB 42 is shown in FIG. 19, with FIG. 20 showing flash pieces still attached thereto.

1 The extrusion head according to the invention with three separate
2 adjustment systems is particularly suitable to fabricate and produce such special
3 profiles with partial material accumulation (cf. section B-B in FIG. 19) as required
4 for KKB 42 in the area of a stub opening (cf. section D-D in FIG. 20).

LIST OF REFERENCE NUMERALS

- 10 Extrusion head
- 12 Mandrel holder
- 14 Mandrel = D 0 (Dzero)
- 16 Extrusion head housing
- 18 Storage space
- 20 Nozzle gap
- 22 tubular parison
- 24 inner edge DS II
- 26 thicker tube zone
- 28 Ribs in 22
- 30 Tooth
- 32 Tooth gap
- 34 Mandrel head for 14*
- 36 Lidded drum (Vanguard FRH-drum)
- 38 Fasset[®]
- 40 Canister
- 42 Plastic fuel tank (KKB)

Nozzle/Mandrel Gap Adjustment Elements:

- DF fixed nozzle ring part
- D 0 first adjustment element = mandrel 14
- DS I second adjustment element = nozzle slide 1
- DS II third adjustment element = nozzle slide 2
- DS III fourth adjustment element = rotatable ring sleeve
- D 0* star-shaped adjustment element on mandrel 14

CLAIMS

1. Extrusion head for producing a tubular parison for the manufacture of blow-molded plastic hollow bodies, including an adjustable ring-shaped tube outlet nozzle with annular nozzle/mandrel gap adjustment elements which permit a targeted adjustment of the nozzle gap for varying the wall thickness of the exiting parison, characterized in that at least three separate nozzle/mandrel gap adjustment elements (D 0 = mandrel, DS I, DS II, DS III) which are differently profiled and exchangeable, and which individually or/and simultaneously can be brought into active engagement in the nozzle gap with the exiting parison from inside and outside, wherein at least two of the adjustment elements (D 0 = mandrel, DS I, DS II, DS III) is hereby adjustable and respectively provided with an adjustment drive.

2. Extrusion head according to claim 1, characterized in that the third additional adjustment element (DS II) is provided for the adjustment of a special profile (e. g. tooth profile) below the adjustment element (DS I) and adapted for acting as last wall thickness influence on the exiting tube.

3. Extrusion head according to claim 1 or 2, characterized in that the lowermost inner edge of the third adjustment element (DS II), which can be brought into engagement with the exiting tube, is disposed at the same level or slightly above the lowermost outer edge of the central mandrel (D 0).

- 1 4. Extrusion head according to claim 1, 2 or 3, characterized in that the third
2 adjustment element (DS II) is provided with its own adjustment drive and is
3 guided for movement and displacement in axial direction.
- 1 5. Extrusion head according to claim 4, characterized in that the adjustment
2 elements (D 0, D 0*, DS I, DS II, DS III) are provided with a quick
3 attachment and configured for easy exchange.
- 1 6. Extrusion head according to one of the preceding claims 1 to 5,
2 characterized in that the third adjustment element (DS II) is of split
3 configuration and made of two 180° half ring segments which are provided
4 with a separate adjustment drive and guided for movement and
5 displacement in radial direction.
- 1 7. Extrusion head according to one of the preceding claims 1 through 6,
2 characterized in that there is provided between adjustment element (DS I)
3 and adjustment element (DS II) a further adjustment element (DS III) which
4 is adjustable, e.g. supported for rotation in circumferential direction
- 1 8. Extrusion head according to claim 7, characterized in that the adjustment
2 element (DS III) has the same special profile (e.g. tooth profile) as the
3 adjustment element (DS I).

1 10. Extrusion head according to claim 9, characterized in that the adjustment
2 element (D 0*) is provided with a special profile (e.g. tooth profile), that the
3 adjustment element (DS I) is provided without profile and smooth
4 throughout about its circumference, and that the adjustment element (DS II)
5 is provided with an oval-profile known per se.

1 11. Extrusion head according to one of the preceding claims 1 to 10,
2 characterized in that the adjustment element (D 0*) is provided with a
3 rectangular tooth profile, wherein - for a 220 liters plastic drum (55 U.S.
4 gallons) with an outer diameter of about 585 mm at drum weight of about
5 9.5 kg - the diameter of the adjustment element is about 190 mm and the
6 inner and outer ring edges interacting with the ejected tube having
7 alternately about 60 grooves of half-round configuration as viewed in cross
8 section, and a complementary number of rectangular teeth, with the width of
9 the grooves being narrower than the width of the teeth.

1 12. Extrusion head according to claim 11, characterized in that the width of the
2 teeth is about 5mm, and the width of the grooves is about 4 mm, at a radial
3 depth of the grooves of about 10 mm.

ABSTRACT

The invention relates to an extrusion head for producing a tubular parison (22) in order to manufacture large-volume, blow molded plastic hollow bodies. The inventive extrusion head has an adjustable ring-shaped tube outlet nozzle for selectively adjusting the nozzle opening (20) in order to alter the wall thickness of the exiting parison (22). In order to provide a multiple adjustability of the extruded tube cross section, the invention provides that the extrusion head comprises at least three separate nozzle/mandrel gap adjustment elements (D 0 = mandrel, DS I, DS II, DS III) which are differently profiled and exchangeable. The elements can be individually and/or simultaneously brought into working contact with the exiting parison (22) in the mandrel gap (20) from inside and/or outside, whereby at least two of the adjustment elements (D 0 = mandrel, DS I, DS II, DS III) are configured such that they can be adjusted. To this end, the at least two adjustment elements are each equipped with a corresponding adjusting drive.

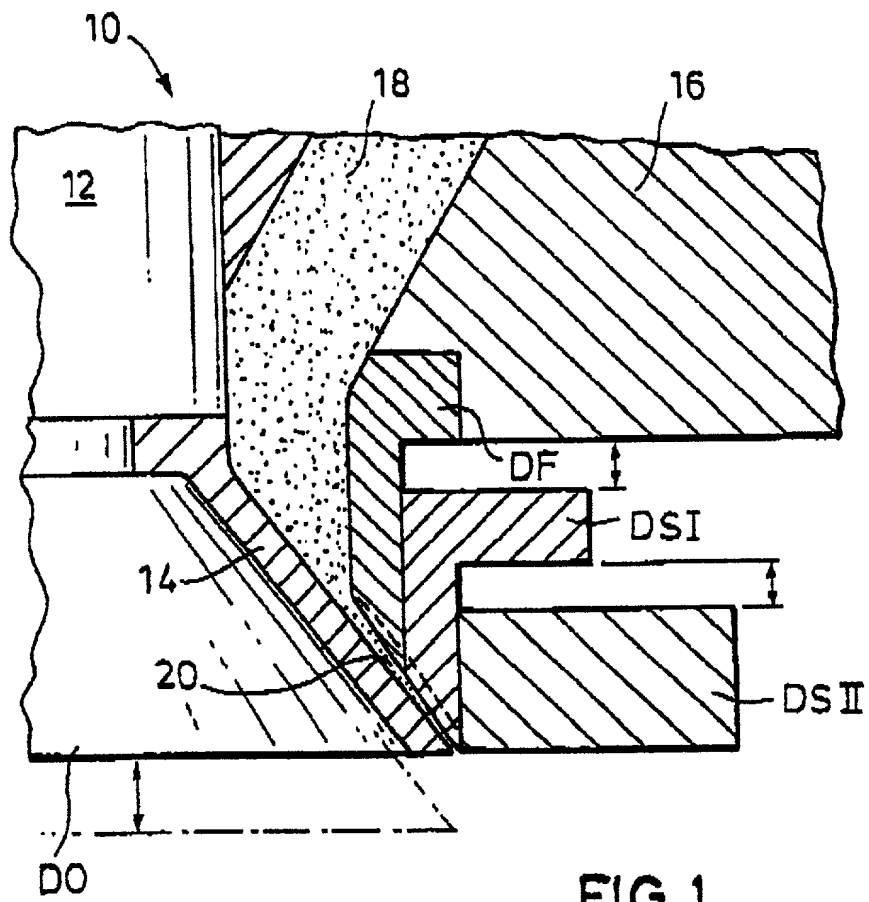
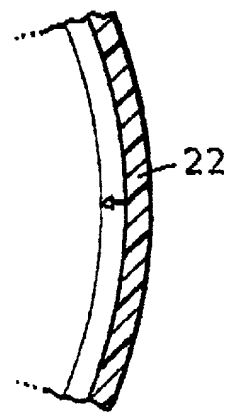
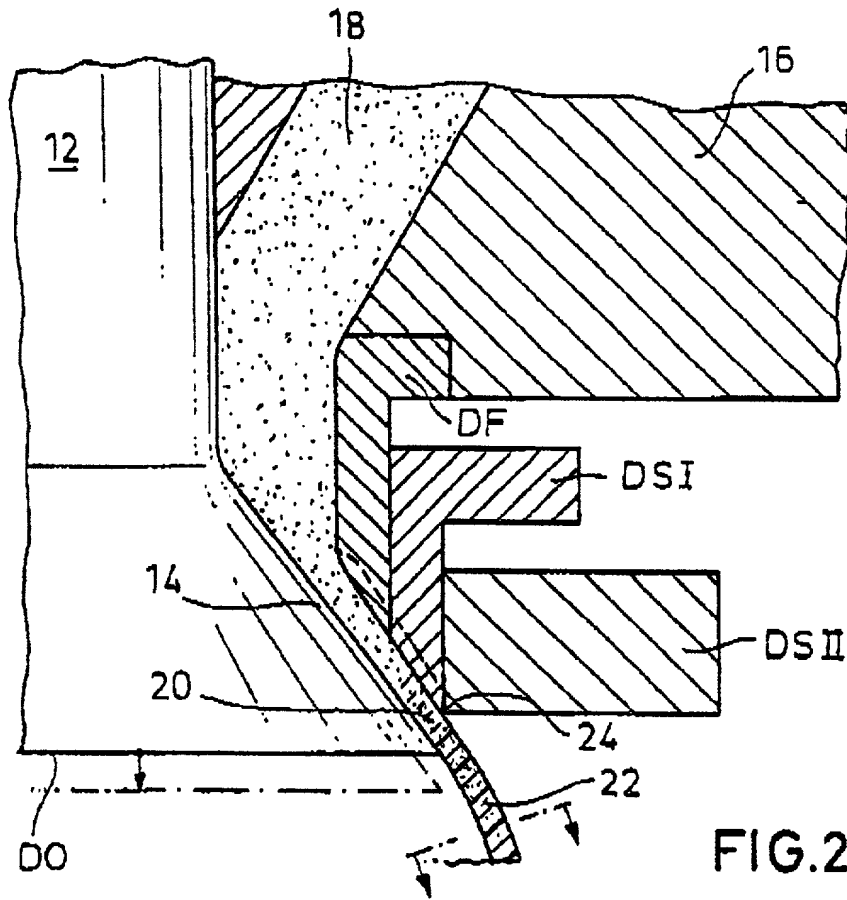
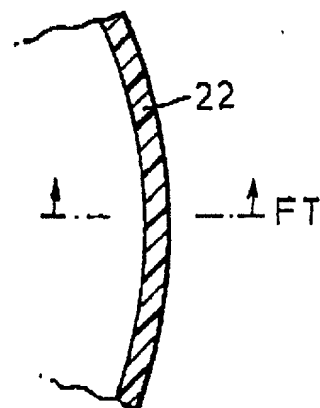
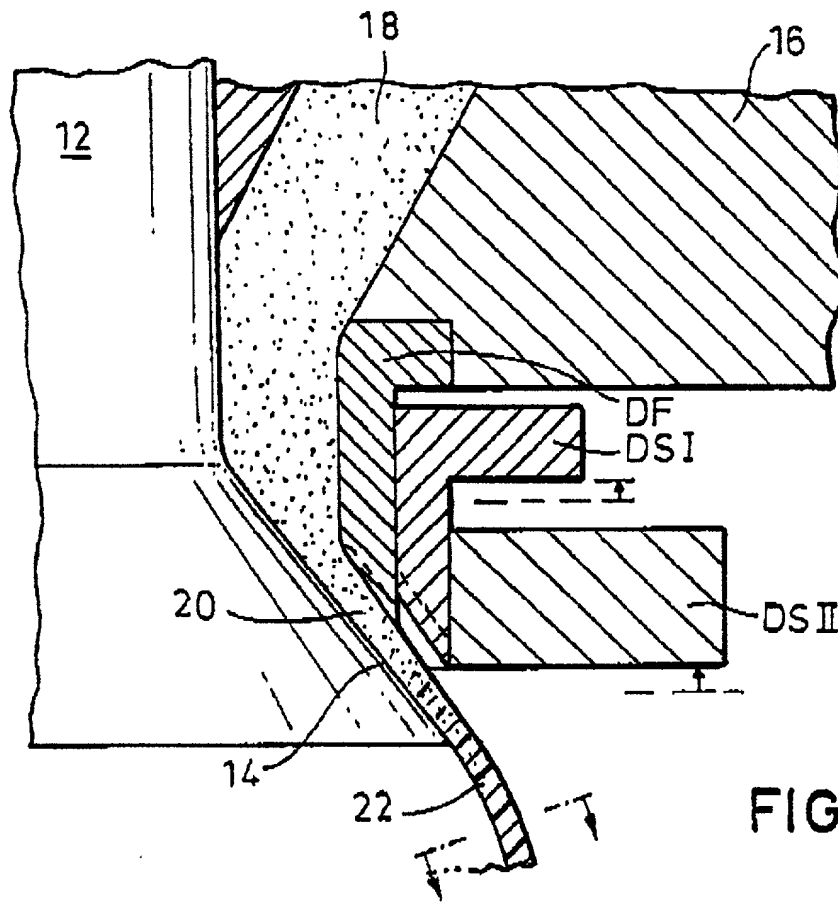
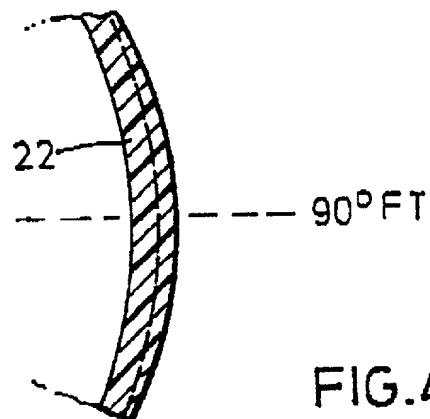
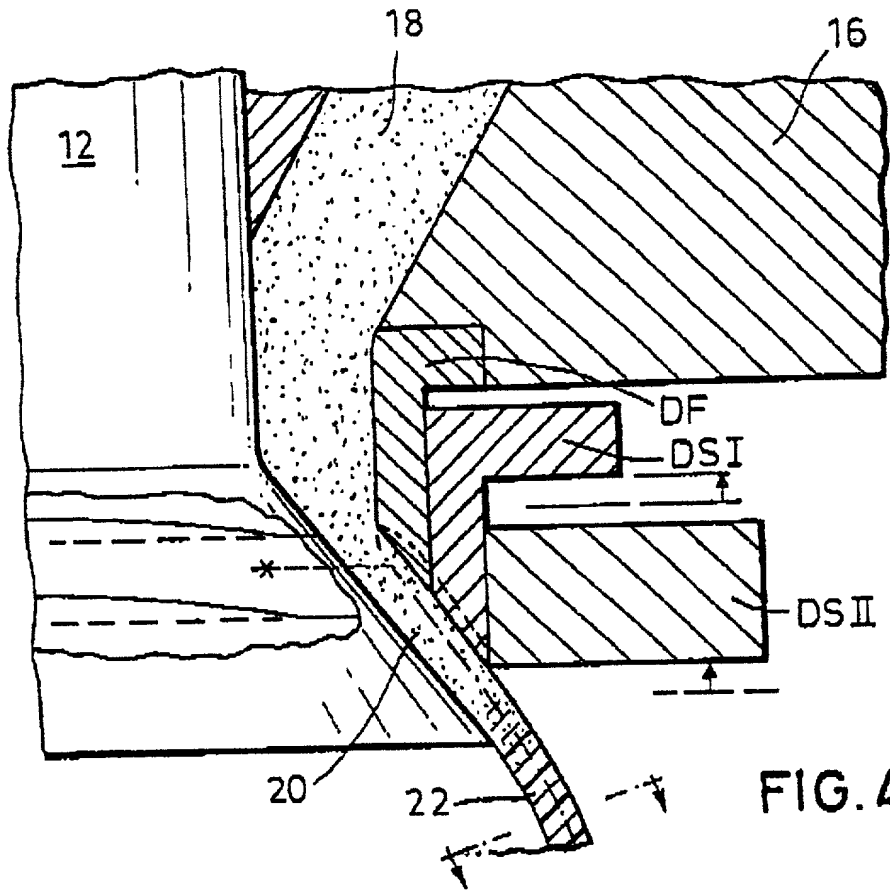


FIG. 1







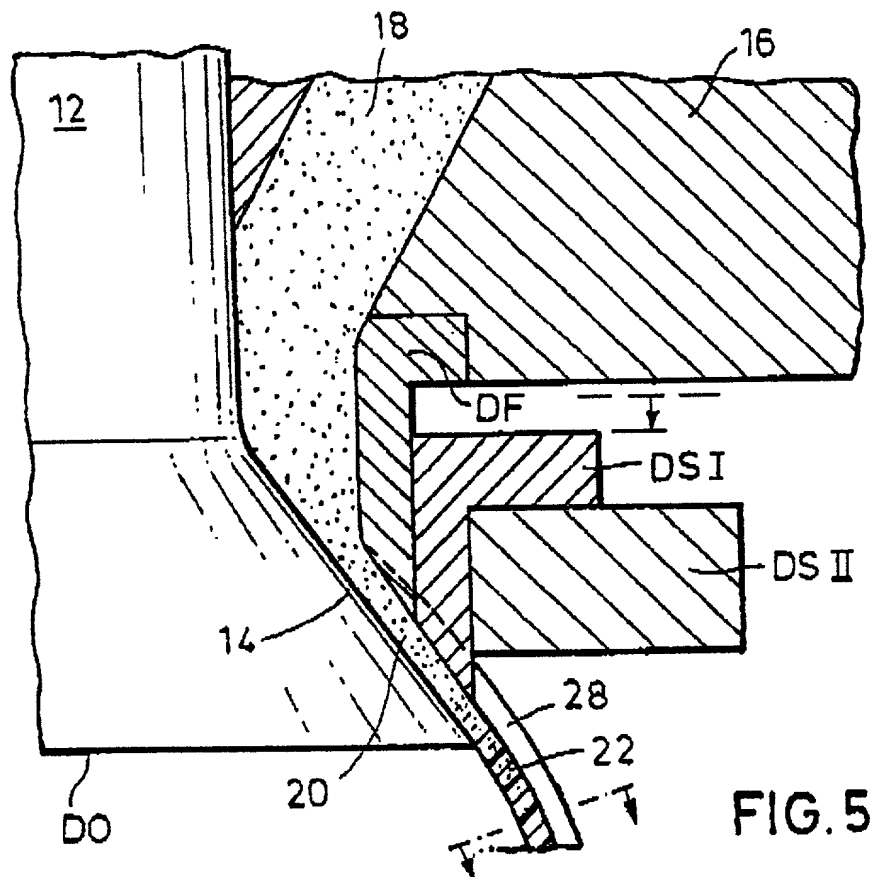


FIG. 5

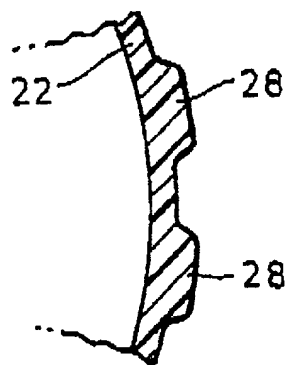


FIG. 5 a.

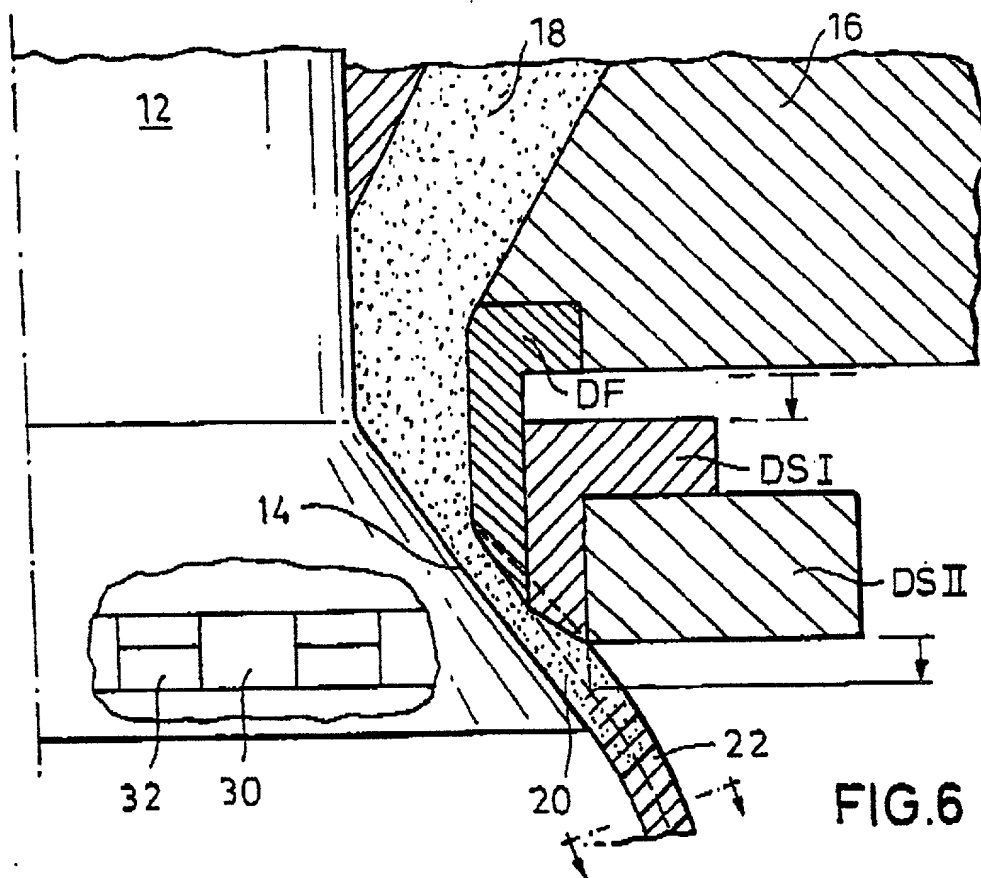
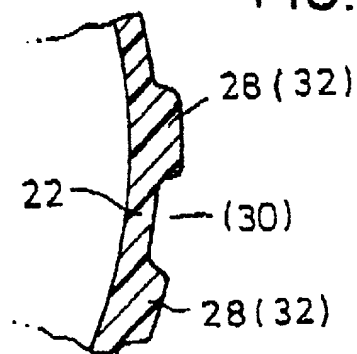


FIG. 6 a



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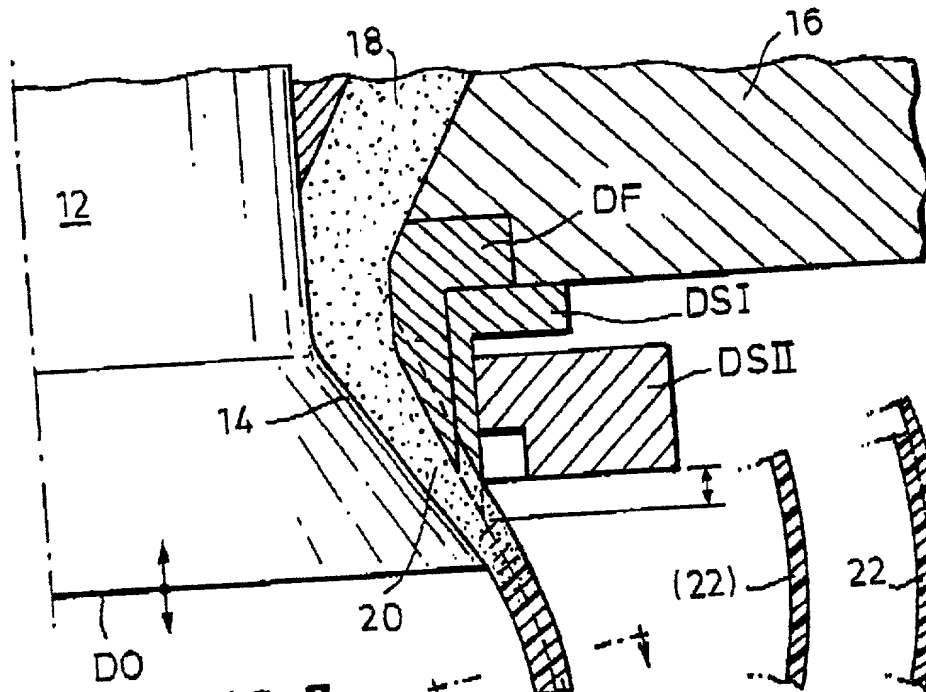


FIG. 7

FIG. 7a

90°FT
FIG. 7b

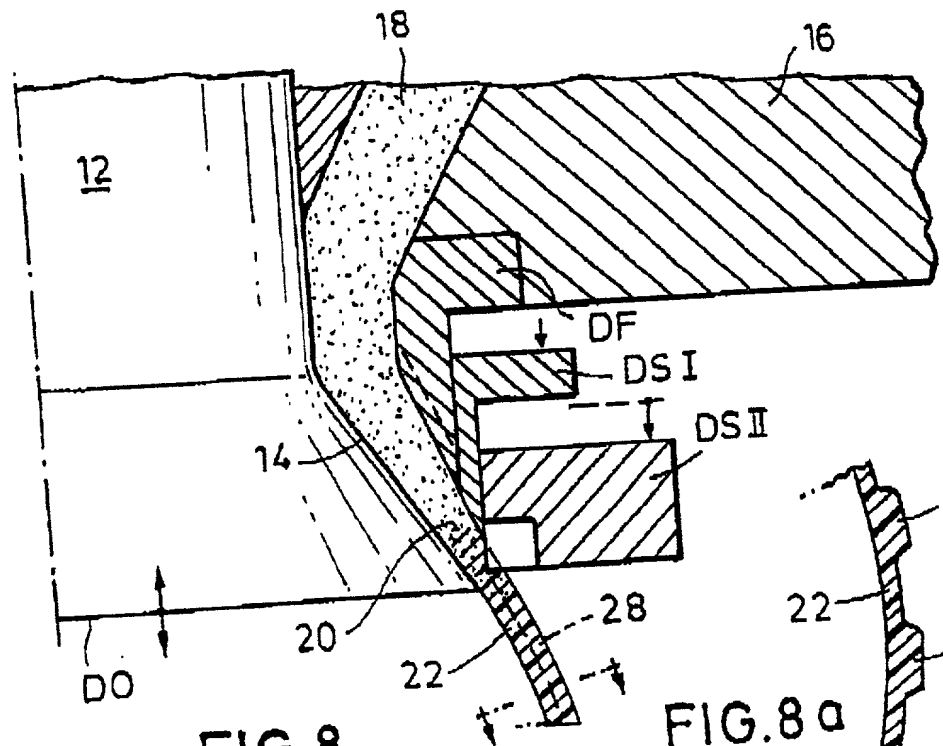
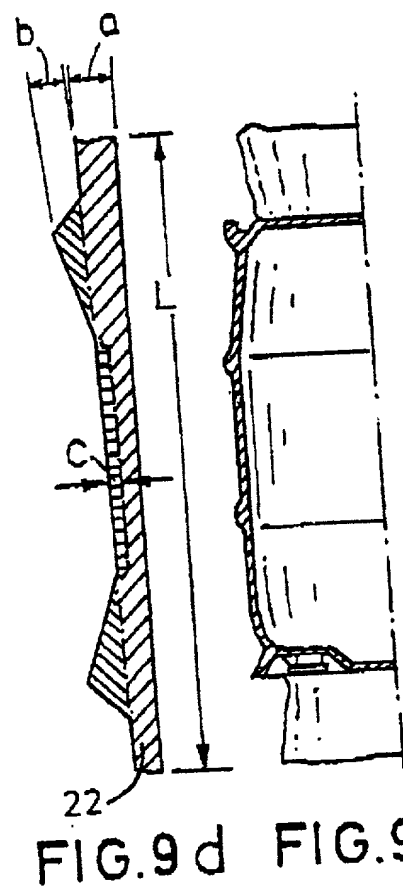
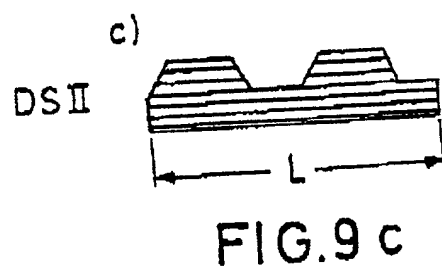
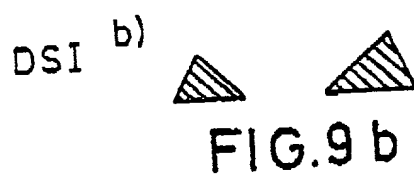
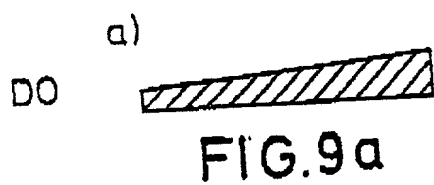
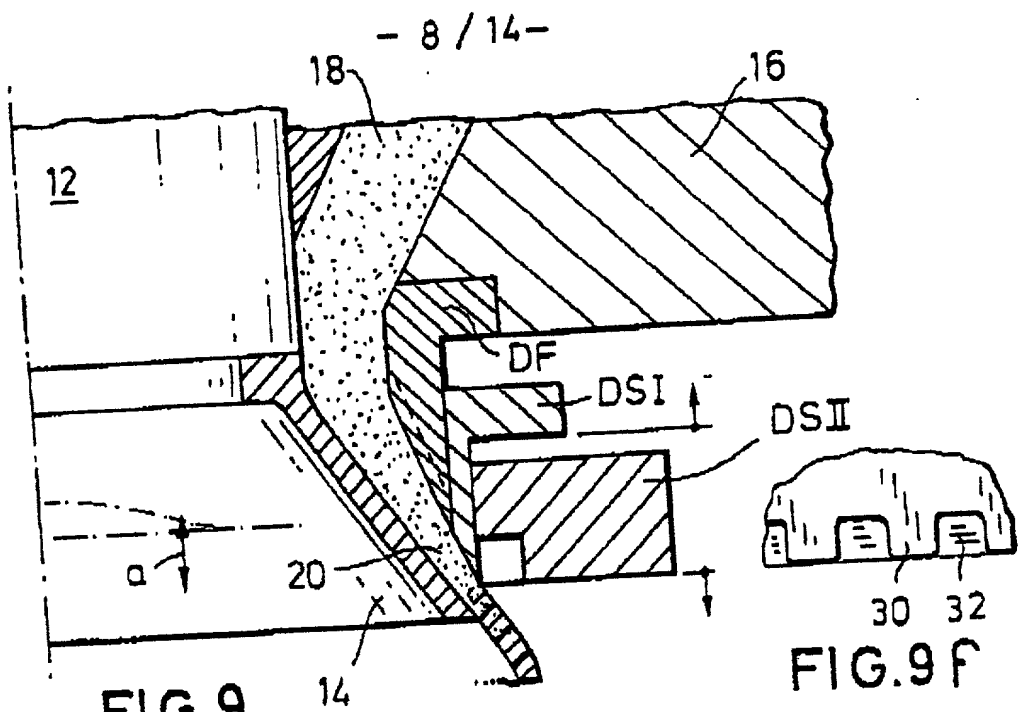


FIG. 8

FIG. 8a

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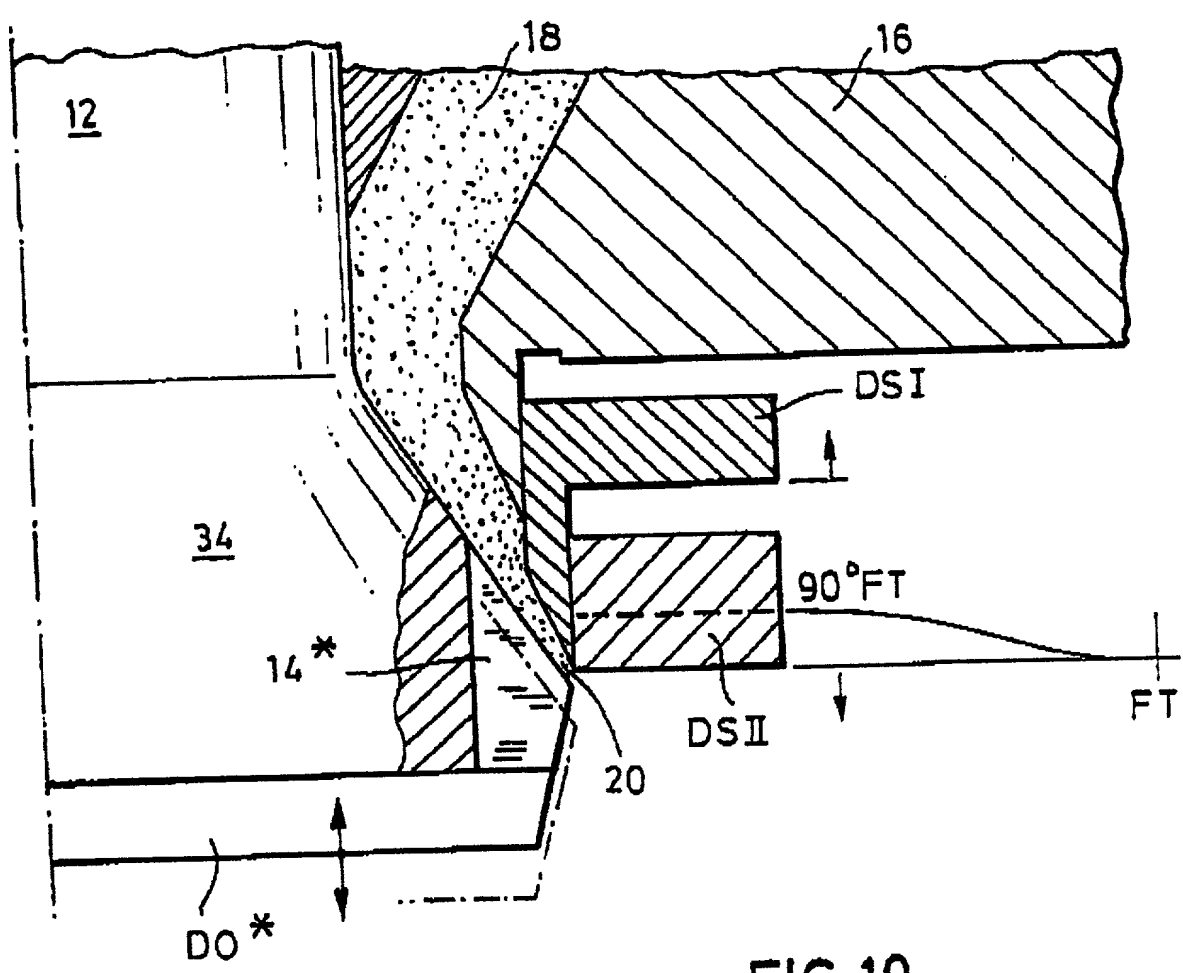
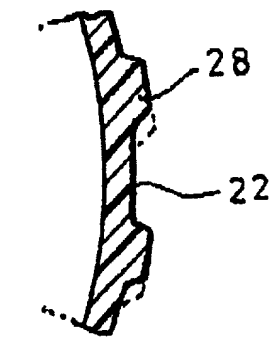
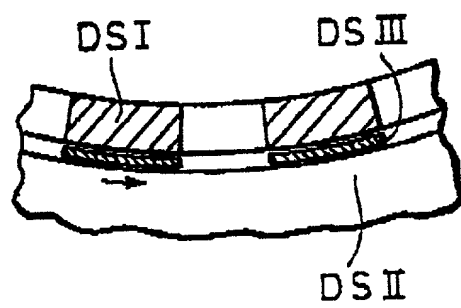
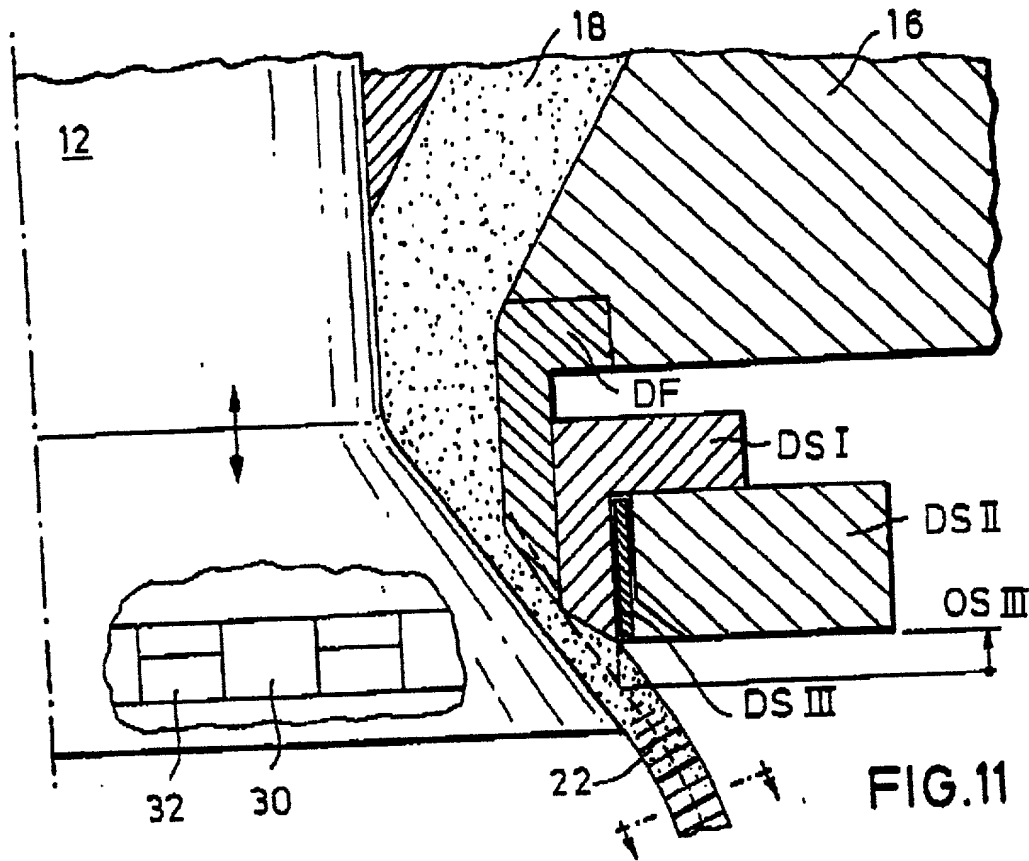
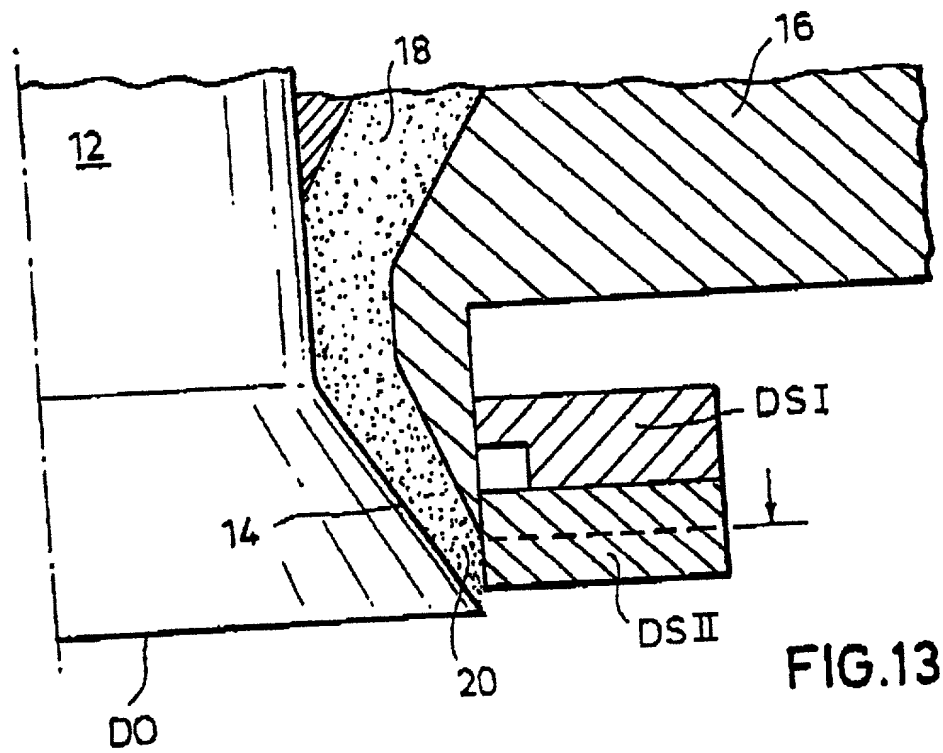
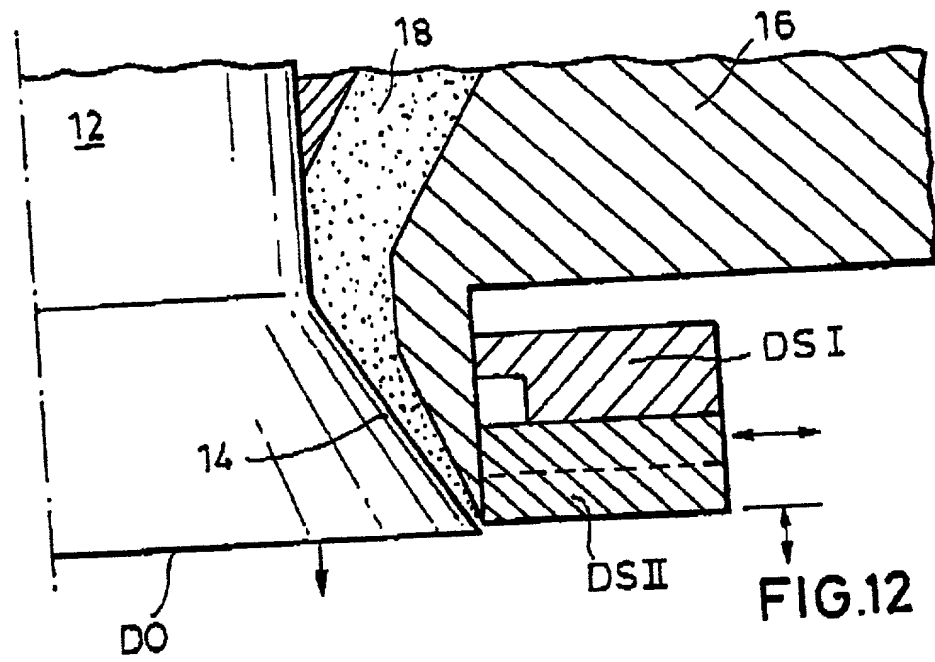


FIG.10

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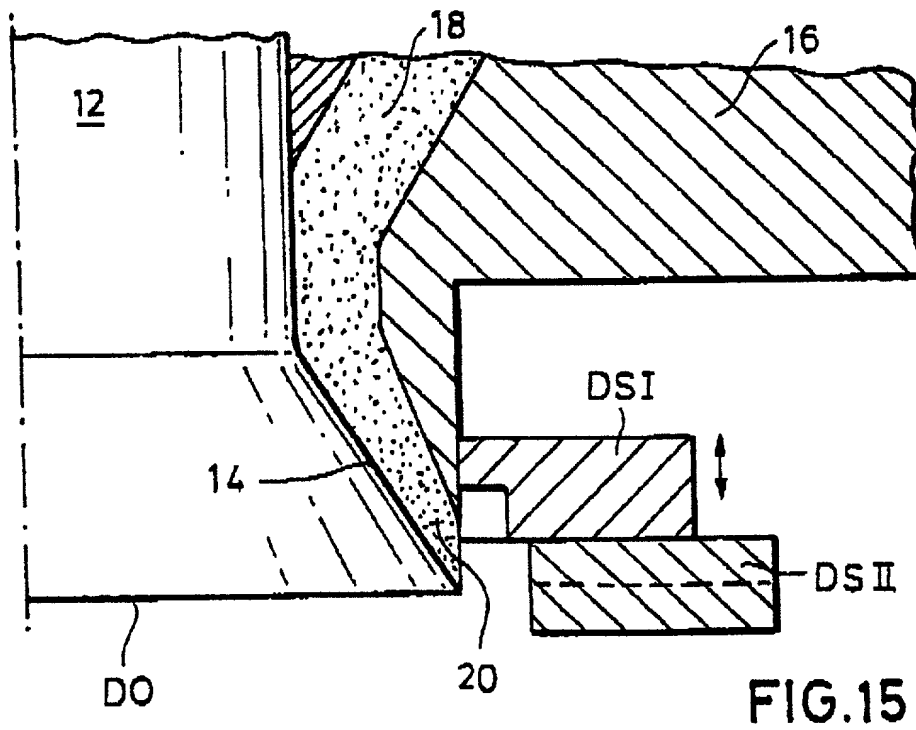
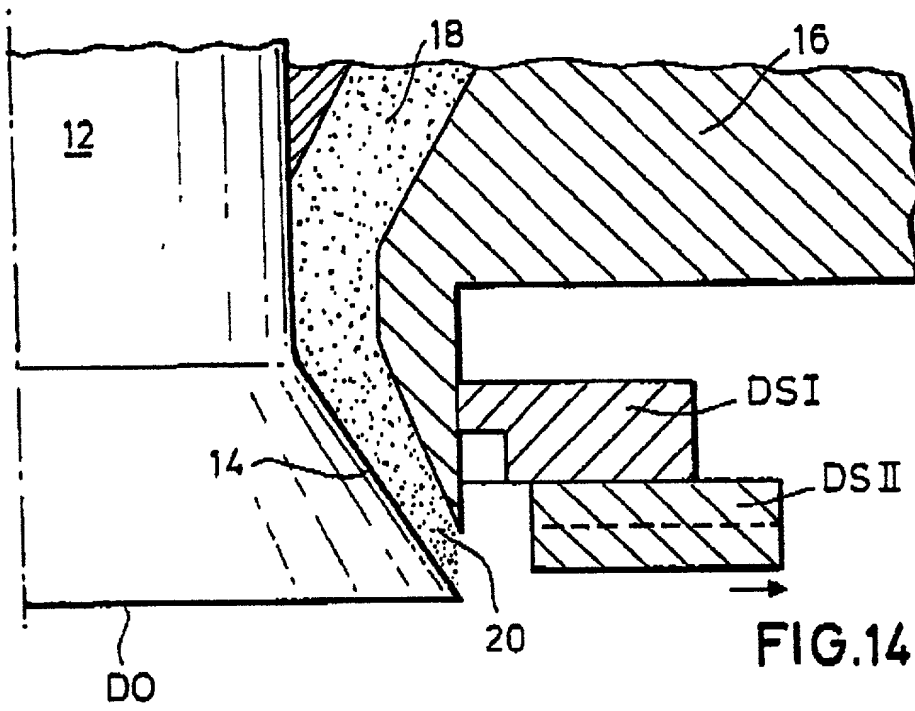


FIG.17

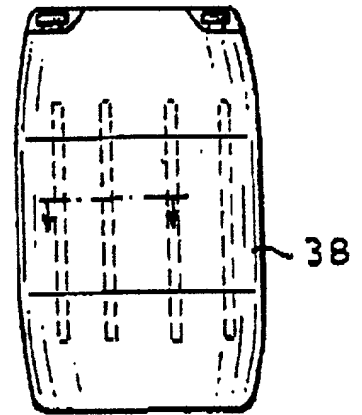


FIG.17a

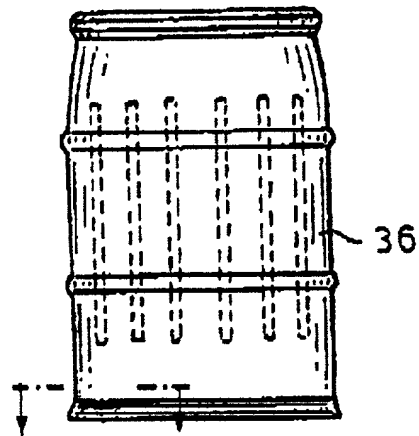


FIG.16

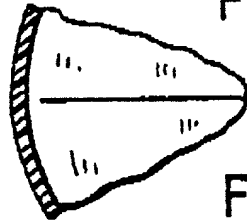


FIG.16a

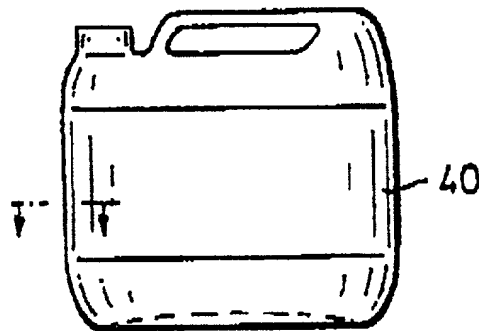


FIG.18

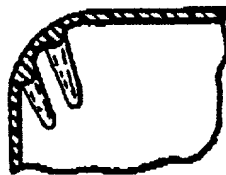


FIG.18a

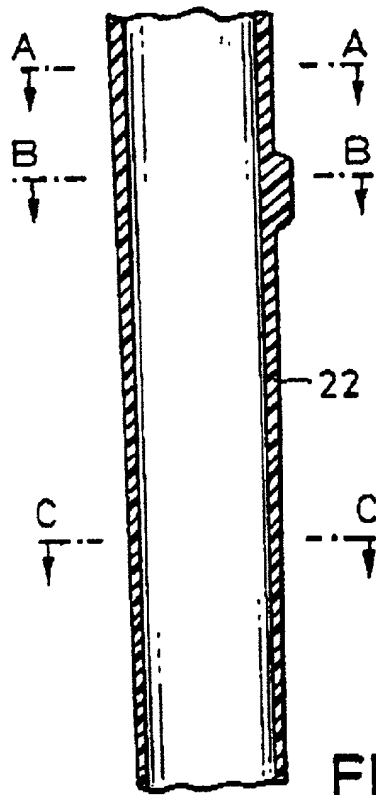


FIG.19

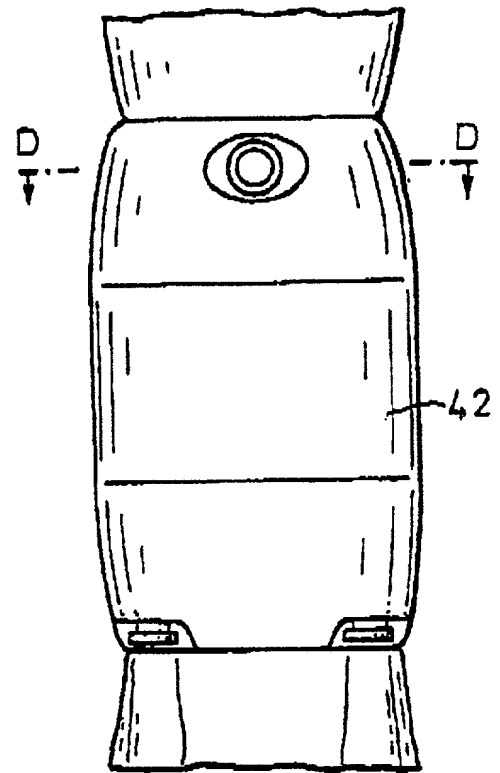
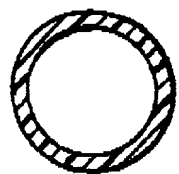
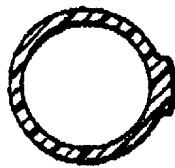


FIG.20



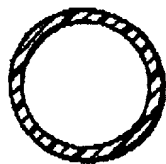
A-A

FIG.19a



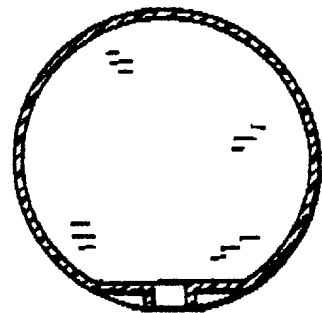
B-B

FIG.19b



C-C

FIG.19c



D-D

FIG.20a

P 02199 Pat-LIS

Declaration and Power of Attorney for Patent Application

Erklärung für Patentanmeldungen mit Vollmacht

German Language Declaration

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☒ wurde angemeldet am 4 März 1999
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 internationalen Anmeldenummer im Rahmen des
 Vertrags über die Zusammenarbeit auf dem
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Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen an, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Titel 37, Code of Federal Regulations, §1.56 von Belang sind.

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I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

EXTRUSION HEAD

the specification of which
(check one)

- ☒ is attached hereto
☐ was filed on 4 March 1999
 as United States Application Number or PCT
 International Application Number
PCT/EP99/01388 and was
 amended on
 (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

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Prior Foreign Applications
(Frühere ausländische Anmeldungen)

Priority Claimed?
Priorität beansprucht?

288 03 760.7 Germany 5/March/1998
(Number) (Country) (Day/Month/Year Filed)
(Nummer) (Land) (Tag/Monat/Jahr eingereicht)

☒ ☐
Yes No
Ja Nein

(Number) (Country) (Day/Month/Year Filed)
(Nummer) (Land) (Tag/Monat/Jahr eingereicht)

☐ ☐
Yes No
Ja Nein

Ich beanspruche hiermit gemäß Titel 35, US-Code, §119(a), den Vorzug aller unten aufgeführten US-Mitsammeldungen

I hereby claim the benefit under Title 35, United States Code, §119(a) of any United States provisional application(s) below

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Full name of first inventor

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Unterschrift des Erfinders

Datum

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Inventor's Signature

Date

Wohnsitz

Kerpen / Germany **DEX**

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Unterschrift des Erfinders

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